Orbit of 9 *Argûs*, β 101. By Professor S. Glasenapp.

(*Letter from Professor S. Glasenapp to S. W. Burnham.*)

The complete measures of 9 *Argûs*, which I have had the honour to receive from you, have enabled me to investigate the orbit of this interesting binary star. I find for this system a period of 40·54 years. The eccentricity is extraordinarily small, being only 0·09.

The following table contains the measures of 9 *Argûs*, made by Dembowski (Δ), the Astronomers at the Cincinnati Observatory (Cin.), Burnham (β), Hall (Hl.) and Schiaparelli (Sp.)

1875·71	289°·4	0″·46	Δ 3*n*
1878·47	302·6	0·45	Cin 4*n*
1878·52	301·8	0·46	β 1*n*
1879·68	306·2	0·38	Hl 2*n*
1882·21	319·7	0·35	Sp 4*n*
1883·11	336·2	0·3	β 1*n*
1889·08	76·4	0·34	β 4*n*
1890·19	83·0	0·4	Sp 2*n*
1890·26	84·6	0·31	β 4*n*
1890·96	88·3	0·36	β 3*n*
1891·15	94·7	0·3	Sp 1*n*
1892·05	98·7	0·22	β 3*n*

From these observations we form the annual means for 1878, 1890, and 1891, assigning to the two measures of distance made by Professor Schiaparelli in 1890 and 1891 a weight equal to one-half, and thus obtain the following normal places:—

1875·71	289°·4	0″·46	1888·26	356°·1	0″·29
78·50	302·2	0·45	89·08	76·4	0·34
79·68	306·2	0·38	90·22	83·8	0·34
82·21	319·7	0·35	91·06	91·5	0·34
83·11	336·2	0·30	92·05	98·7	0·22

By the graphical method we obtain the geometrical elements of the true orbit as follows:—

$$\Omega_0 = 116^\circ\!\cdot\!6 \qquad e_0 = 0^\circ\!\cdot\!105$$
$$i_0 = 55\cdot8 \qquad a_0 = 0''\!\cdot\!48$$
$$\lambda_0 = 252\cdot3$$

And then the dynamical elements from the first and last observations :—

$$T_0 = 1843{\cdot}02$$
$$n_0 = +8^\circ{\cdot}774$$
$$u_0 = 41{\cdot}03 \text{ years.}$$

We obtain the following corrections to the elements by the method of least squares :—

$$\Delta T = +1{\cdot}00 \text{ years}; \ \Delta n = +0^\circ{\cdot}106; \ \Delta\Omega = +0{\cdot}1;$$
$$\Delta i = +3^\circ{\cdot}4; \ \cancel{\Delta\lambda = -1^\circ{\cdot}0}; \ \cancel{\Delta e = -0{\cdot}015}; \ \cancel{\Delta a} = -0''{\cdot}03.$$

So that the most probable elements of the true orbit of 9 *Argûs* will be :—

$T = 1844{\cdot}02$	$i = 59^\circ{\cdot}2$
$u = 40{\cdot}54$ years	$\lambda = 251^\circ{\cdot}3$
$n = +8^\circ{\cdot}880$	$e = 0{\cdot}090$
$\Omega = 116^\circ{\cdot}7$	$a = 0''{\cdot}45$

The comparison of these elements with the observations is given in the following table :—

T	θ_o	θ_c	$\theta_o - \theta_c$	ρ_o	ρ_c	$\rho_o - \rho_c$
	°	°	°	″	″	″
1875·71	289·4	287·5	+1·9	0·46	0·43	+0·03
78·50	302·2	301·1	+1·1	0·45	0·42	+0·03
79·68	306·2	307·4	−1·2	0·38	0·40	−0·02
82·21	319·7	324·9	−5·2	0·35	0·32	+0·03
83·11	336·2	333·7	+2·5	0·30	0·29	+0·01
89·08	76·4	73·6	+2·8	0·34	0·27	+0·07
90·22	83·8	85·4	−1·6	0·34	0·32	+0·02
91·06	91·5	92·1	−0·6	0·34	0·35	−0·01
92·05	98·7	98·7	0·0	0·22	0·38	−0·16

The position of this star for 1880 is :—

$$\left.\begin{array}{l} \alpha = 7^h\ 46^m\ 13^s \\ \delta = -13^\circ\ 35' \end{array}\right\}$$

The system has an annual proper motion of $0''{\cdot}345$ in the direction of $195^\circ{\cdot}7$. It should receive the attention of astronomers with large telescopes.

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Orbit of the Double Star κ Pegasi A C.
By Professor S. Glasenapp.

(*Communicated by S. W. Burnham.*)

In 1880 Mr. S. W. Burnham, M.A., discovered the duplicity of the large star of the binary *κ Pegasi* ($\alpha = 21^{h}\ 39^{m}{\cdot}7$, $\delta = +25^{\circ}\ 8'$ for 1890). The new companion (C) has been observed only by Mr. Burnham and by the late R. Engelmann; no other observations have been published. The following observations have been kindly communicated to me by Mr. S. W. Burnham:—

T	θ	ρ	Observer.	
	°	″		
1880·68	137·9	0·27	β	4*n*
83·02	116·0	0·16	En	1*n*
84·01	140·0	0·25	En	1*n*
84·87	104·7	0·22	β	1*n*
88·78	274·7	0·23	β	3*n*
89·51	262·3	0·14	β	4*n*
90·57	187·1	0·10	β	4*n*
91·61	150·0	0·10	β	3*n*
91·81	144·6	0·13	β	4*n*
92·36	135·1	0·17	β	1*n*

For the investigation of the orbit we take a simple mean of the three observations, made in 1883 and 1884 by Engelmann and Burnham; in this manner we obtain for 1883·97 a mean position $\theta = 120^{\circ}\ 2$ and $\rho = 0''{\cdot}21$. It would be better perhaps to reject the observation of Engelmann made in 1884, but as the value of the measures can be estimated only after the investigation of the orbit, we retain it.

The following table, therefore, embraces all the measured positions:—

T	θ	ρ	T	θ	ρ
	°	″		°	″
1880 68	137·9	0·27	1890·57	187·1	0·10
83·97	120·2	0·21	91 61	150·0	0·10
88 78	274·7	0·23	91·81	144 6	0 13
89·51	262·3	0·14	92·36	135·1	0·17

It is evident that the satellite has described a whole revolution; the elements of the orbit can therefore be determined with satisfactory precision. By the graphical method we very easily obtain the following system of elements:—